

**Environment and Natural Resources Trust Fund
2012-2013 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 044-C1

Invasives Reduction: Mobile Emergency Ballast Water Treatment System

Topic Area: C1. Invasive Species - Aquatic

Total Project Budget: \$ 1,310,200

Proposed Project Time Period for the Funding Requested: 2.5 yrs. July 2013 - December 2016

Other Non-State Funds: \$ 0

Summary:

This pilot project will develop, demonstrate deployment, establish biological efficacy, and deliver two (2) mobile emergency ballast water treatment systems for the Great Lakes.

Name: Kevin Reynolds

Sponsoring Organization: National Parks of Lake Superior Foundation

Address: 1901 W Ridge St, Ste 9
Marquette MI 49855

Telephone Number: (906) 362-3152

Email brady@nplsf.org

Web Address www.nplsf.org

Location

Region: NE

County Name: Cook, Lake, St. Louis

City / Township:

| | | | | | | | |
|--------------------------|--------------------|--------------------------|-------------------|--------------------------|-----------------------|--------------------------|----------------------------------|
| <input type="checkbox"/> | Funding Priorities | <input type="checkbox"/> | Multiple Benefits | <input type="checkbox"/> | Outcomes | <input type="checkbox"/> | Knowledge Base |
| <input type="checkbox"/> | Extent of Impact | <input type="checkbox"/> | Innovation | <input type="checkbox"/> | Scientific/Tech Basis | <input type="checkbox"/> | Urgency |
| <input type="checkbox"/> | Capacity Readiness | <input type="checkbox"/> | Leverage | <input type="checkbox"/> | Employment | <input type="checkbox"/> | TOTAL <input type="checkbox"/> % |



Environment and Natural Resources Trust Fund (ENRTF) 2012-2013 Main Proposal

PROJECT TITLE: Invasives Reduction: Mobile Emergency Ballast Water Treatment System

Project Summary: This pilot project will develop, demonstrate deployment, establish biological efficacy, and deliver two (2) mobile emergency ballast water treatment systems for the Great Lakes.

I. PROJECT STATEMENT

LCCMR Grant #33784 enabled us to develop and trial advanced ballast water mixing methods and deliver the world’s first emergency response guide (see below links). This groundwork has been followed by our building and trialing a prototype system (see graphic). We are proposing the next phase: ***Develop, demonstrate, and deliver two (2) mobile emergency response systems for the Great Lakes. These systems will be activation ready for high risk ship arrivals or regulatory interventions.***

Ballast introduced aquatic invasive species (AIS) pose a tremendous threat to aquatic resources in the Great Lakes. Estimates for AIS species damage in the Great Lakes range from a conservative \$200 million to \$5.7 billion. These figures do not account for significant changes in the large lakes food webs, nor the potential costs of long term impacts from new diseases that cannot be eradicated. The EPA has identified shipping/ballast water as the source of 65% of invasions from 1960-2006.

Recent US Coast Guard and EPA rule development will eventually lead to wide-scale installation of onboard ballast water treatment systems. However, the standards for these systems for larger marine vessel size classes will be phased-in through 2021 and the smaller marine vessels phase-in schedule is not yet defined. Further, two critical gaps will remain even as onboard treatment becomes a reality: **1) the lack of ballast treatment options for emergency groundings in the absence of on-board treatment systems; and 2) the lack of ballast treatment options for ships when inadequate shipboard ballast treatment occurs from mechanical failures or other reasons.**

The proposed mobile ballast water treatment systems address these gaps. The project objectives are: 1) develop optimal mixing technology for expected ballast water tank configurations; 2) establish biological efficacy and residual toxicity for system chemical dosing protocol; and 3) demonstrate practical application for Great Lakes ports.

II. DESCRIPTION OF PROJECT ACTIVITIES

| PROJECT ACTIVITIES | Budget: |
|---|-----------|
| Activity 1: Mixing system research and development | \$422,000 |
| Establish a standard method to evaluate mixing system efficiency and deployment practicality; Scale and computational modeling to optimize and evaluate nozzle mixing, deployable air lift, and propeller based mixing methods. | |
| Activity 2: Applications library | \$90,000 |
| Categorize typical marine vessel tank volumes and configurations; Computational modeling of mixing methods for these configurations; documentation of results in handbook. | |
| Activity 3: Chemical dosing | \$60,000 |
| Develop dossier for handling of chemicals in manner safe for personnel, environment, and marine vessels; Establish protocols for treatment doses based on tank volumes and hold times; Establish neutralization protocols. | |
| Activity 4: Deployment ready system | \$228,000 |
| Design and build marinized system based on research and development; Deliver system for trials. | |

| | |
|--|-----------|
| Activity 5: Efficacy trials | \$336,200 |
| Utilize the emergency response system three (3) times on a ship of opportunity calling in a Great Lakes port; Perform efficacy and toxicity testing. | |
| Activity 6: Delivery | \$132,000 |
| Provide two (2) emergency response systems to Duluth, complete with user manuals and response protocols; Provide implementation plan. | |

| Outcome | Completion Date |
|---|------------------------|
| 1. Development and construction of marinized mixing and dosing system. | <i>March 2014</i> |
| 2. Perform three (3) demonstration and biological efficacy trials of complete system, including chemical dosing and neutralization process. | <i>June 2015</i> |
| 3. Deliver two (2) systems and implementation plan for use in Great Lakes. | <i>October 2015</i> |

III. PROJECT STRATEGY

A. Project Team/Partners: This core team of researchers, marine engineers and government support personnel has tackled two of the most needed problems for ballast treatment: a permanent treatment system for freshwater “lakers” and an emergency treatment system. Over \$3 million has been invested by various partners to bring these systems to the point of a pilot project.

There remains significant work to complete this development, but our team’s record of performance and unique skill/experience sets provide confidence in a successful outcome. For this specific grant the group will provide the following support (see budget attachment for details). The National Parks of Lake Superior Foundation will be the LCCMR single point of contact, performing all contacting efforts and ensuring appropriate and timely reporting of progress. The National Park Service will liaison with appropriate federal and local regulatory agencies, coordinate the multiple stakeholders, manage required permits, and oversee technology transfer of final products. US Geological Survey will be the Principal Investigator of the research and development efforts, and ensure quality control of the overall program. David Hand, Ph.D. at Michigan Technological University will develop chemical dosing protocols. Clorox Company will provide required chemical registrations. The Glostien Associates, a naval architecture and marine engineering firm, will design, build, trial, and deliver the emergency response equipment. Biological efficacy and residual toxicity testing during the system demonstration will be coordinated with the Great Ships Initiative, where both bench and shore station testing has occurred.

B. Timeline Requirements: This project will span approximately 2 years with biological efficacy testing coordinated to meet required water quality and organism density “challenge” conditions. The first shipboard testing is planned for fall of 2013 with the remainder of the testing planned for summer 2014. It is possible, however, that testing could run into 2015 if such flexibility is required by the active, commercial ships where testing is planned.

C. Long-Term Strategy and Future Funding Needs

To effectively stop AIS transfers into the Great lakes and Minnesota’s harbors will require broad acceptance of this system at both fresh and saltwater ports. If Minnesota will support the freshwater development, the National Park Service and the Foundation will pursue testing and pilot project implementation at additional saltwater ports. LCCMR Grant # 33784 document links include:
<http://www.nps.gov/isro/naturescience/upload/09078-Ballast-Water-Mixing-Field-Trials-RevB.pdf>
<http://www.nps.gov/isro/naturescience/upload/09078-Ballast-Water-Emergency-Response-Guidance-RevB.pdf>

2012-2013 Detailed Project Budget

Invasives Reduction: Mobile Emergency Ballast Water Treatment System

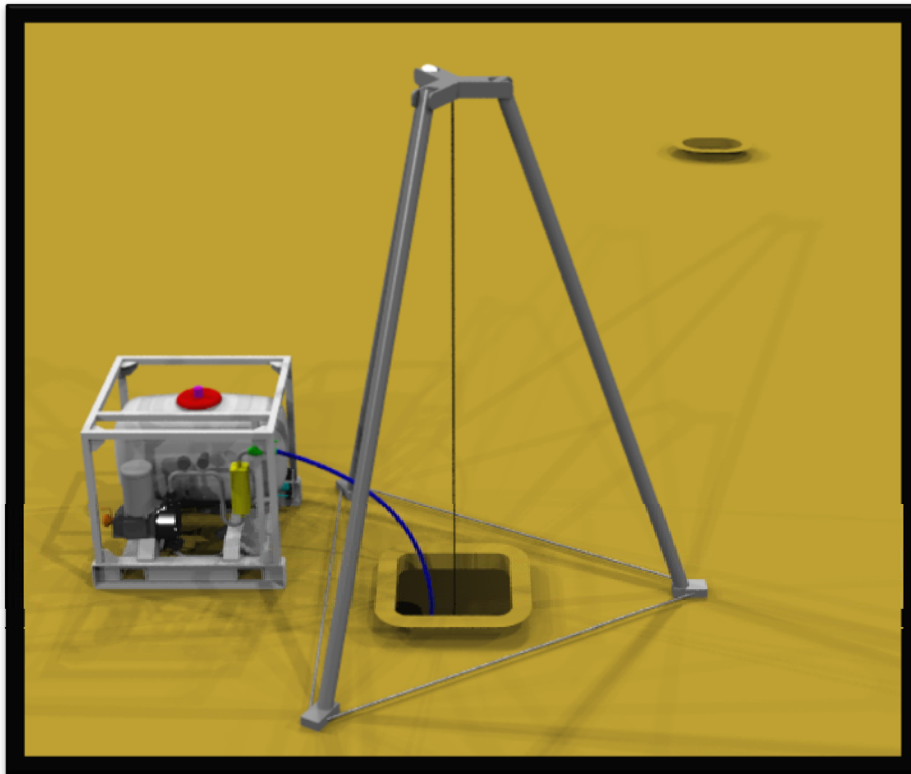
IV. TOTAL ENRTF REQUEST BUDGET 2 years

| BUDGET ITEM (See list of Eligible and Non-Eligible Costs, p. 11) | AMOUNT |
|--|---------------------|
| Personnel: | NA |
| Contracts: Two Year Duration: Project Management, Research and Development, Survey and Analysis Work, Field Trials, and Documentation. | \$ 592,200 |
| Equipment/Tools/Supplies: Three (3) prototype mixing systems for development; Two (2) systems for full-scale trials; Two (2) systems for final delivery; Manuals and Plans. | \$ 718,000 |
| Acquisition (Fee Title or Permanent Easements): | NA |
| Travel: | NA |
| Additional Budget Items: | NA |
| TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST = | \$ 1,310,200 |

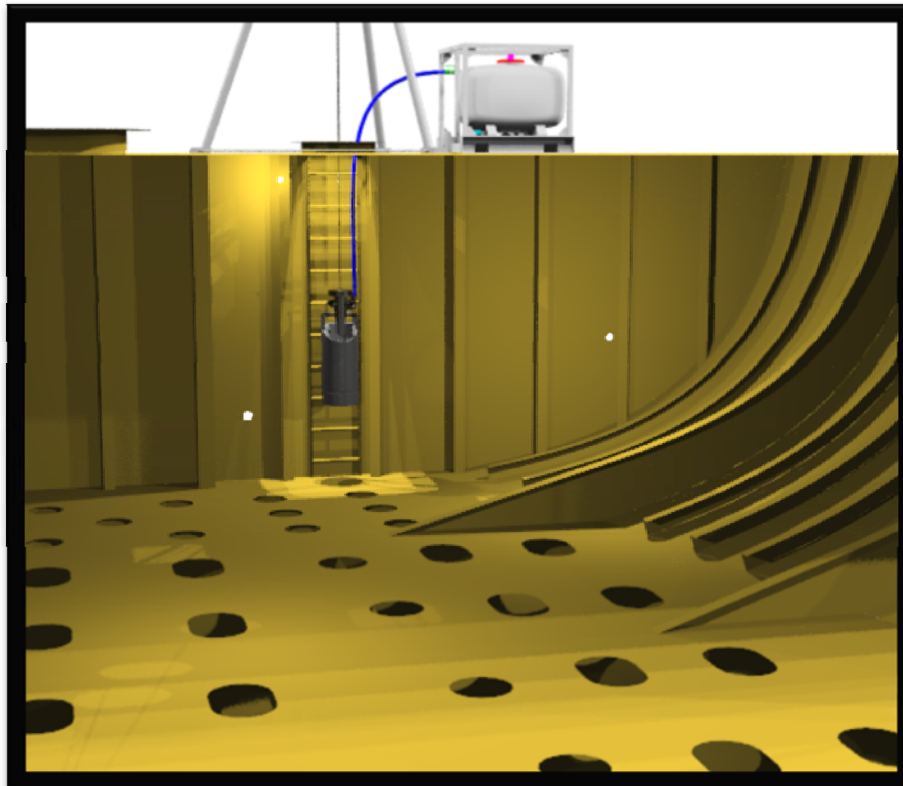
V. OTHER FUNDS

| SOURCE OF FUNDS | AMOUNT | Status |
|--|---------------|---------------|
| Other Non-State \$ Being Applied to Project During Project Period: | \$ - | |
| GSI biological efficacy testing: Note: Currently GSI does not charge for services. If they do within the operating time period the team will discuss the effects on the project with LCCMR and how to proceed. | \$ 150,000 | |
| Other State \$ Being Applied to Project During Project Period: | NA | |
| In-kind Services During Project Period: | | |
| Trials support by ship company - The ship crew will provide significant support plus free room and board during the trials to our team. Additionally, the inevitable delays caused by our trials will cost the company money, but we do NOT include lost revenues in this cost estimate. | \$ 50,000 | |
| National Park Service - Provides coordination and help with regulatory compliance. | \$ 25,000 | |
| Michigan Technological University - Dr. David Hand and others will provide significant support in determining proper dosing protocols, review of test procedures, and help in designing the system. | \$ 30,000 | |
| The Clorox Company - Will provide support for regulatory approval process. | \$ 10,000 | |
| Remaining \$ from Current ENRTF Appropriation (if applicable): | NA | |
| Funding History: | | |
| LCCMR grant # #33784 | \$ 125,000 | |

Invasives Reduction: Mobile Emergency Ballast Water Treatment System Illustration



Vessel deck access point to ballast tank



Cross-section of access point, mixing system deployed

Invasives Reduction: Mobile Emergency Ballast Water Treatment System

Project Manager Qualifications and Organization Description

Kevin J. Reynolds, PE from The Glosten Associates will perform the role of Project Manager and lead the development team. This selection balances the demands of delivering a commercial marine product on budget and within schedule with a requirement for the application to be based on sound science. Kevin will be closely partnered with Barnaby Watten, Ph.D. from the US Geological Survey who will lead the research and development aspects of the project, and Phyllis Green of the National Parks Service who will lead permitting, interface and communications with Great Lakes stakeholders regarding the overall strategy for emergency treatment implementation, and Carol Brady of National Parks of Lake Superior Foundation who will manage the grant.

Kevin is a Senior Associate with the fifty year old, seventy person naval architecture firm, The Glosten Associates. Kevin joined Glosten after six years of working on board merchant ships and three years as a shipyard new construction engineer. Since joining Glosten in 2001, Kevin has focused his practical experience on developing solutions to limit the spread of aquatic invasive species from ship's ballast water. Kevin brings to the project a set of experiences and qualifications that uniquely positions him to lead the team.

- Professional Engineer in Naval Architecture/Marine Engineering. Kevin will ensure that designs meet marine regulatory requirements and best practices.
- US Coast Guard Licensed Chief Engineer, Unlimited. Kevin will guide product development to a solution that is practical given the realities of shipboard challenges.
- Great Lakes Bulker Mixing Trials Lead Engineer. Kevin experience on Lakers will focus the team on solutions catered to the Great Lakes.
- Founding Member of Golden Bear Ballast Water Test Facility. Kevin understands the development and execution of rigorous ballast water treatment system testing plans.
- Member of EPA Science Advisory Board, Augmented for Ballast Water. Kevin will lead the team to science based solutions that are protective for the environment.

Fiduciary responsibility for the project will be managed by Carol Brady of The National Parks of Lake Superior Foundation. The Foundation has worked closely with Glosten and US Geological Survey for over three years on a series of successful projects. The Foundation has been working to bring new ballast water treatment technologies to ships that ply Lake Superior and the other Great Lakes. The Foundation has helped secure funding for three separate studies related to the design, study and installation of a promising new ballast water treatment technology involving sodium hydroxide (NaOH). Beyond developing the technology, the work of the foundation has helped foster important relationships between the shipping industry, regulators, academia and others which will hopefully lead to an effective solution to the threat of aquatic invasive species in ballast water. Projects Include: 1) The Emergency Response System -- The Great Lakes Fishery Trust provided \$185,000 for this project. Preventing aquatic nuisance species (AIS) introductions via ballast during emergencies or quarantines requires effective mixing of biocides in full and empty ballast tanks. Defining an effective delivery system to treat ballast tanks during short timelines was the focus for this applied research for use in emergency situations, or as a basis for interim treatment.

2) NaOH Practicality Study – The Great Lakes Fishery Trust provided \$78,200 for this project. The project evaluated and determined the practicality of a sodium hydroxide biocide delivery system for Lakers and 3) NaOH Shipboard Trials – This project received \$776,320 in funding from a Great Lakes Restoration Initiative grant through the U.S. Fish & Wildlife Service. This project builds on the practicality study and will allow the U.S. Geological Survey to design and test a NaOH ballast treatment system on one of the largest Great Lakes freighters (Lakers), the *M/V Indiana Harbor*.